Antarctic Achievements
·1957–1982·

New Zealand's Role in the Antarctic

Antarctic Division
Department of Scientific and Industrial Research

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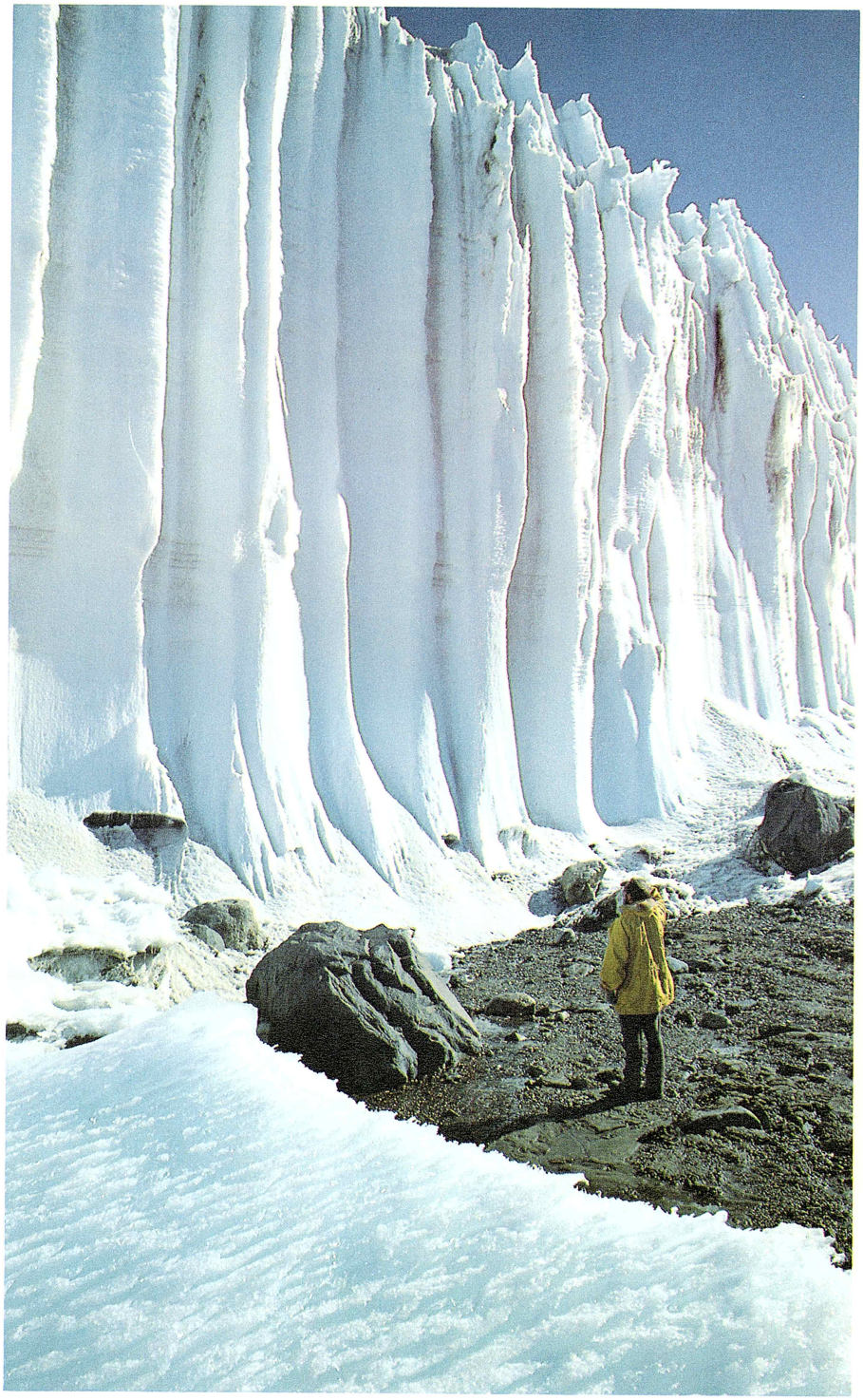
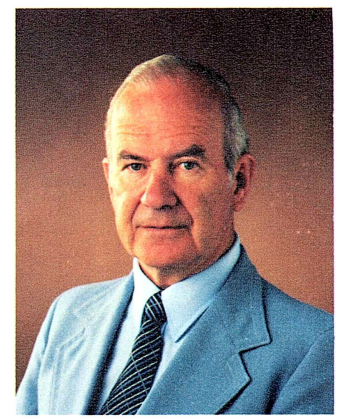


Snout of the Canada Glacier, Taylor Valley, Victoria Land.

Foreword



R. B. Thomson, Superintendent, Antarctic Division, Department of Scientific & Industrial Research.

Antarctica is best known for its remoteness and harsh polar climate. These factors have contributed to its short history of human activity for Antarctica remained undiscovered until just 160 years ago and man set foot there a mere 80 years ago.

This year (1982) is of special significance to polar regions for it marks the anniversaries of three major international co-operative projects in these areas: the centenary of the first International Polar Year (IPY) and the 50th and 25th anniversaries of the second and third IPYs. The latter was renamed the International Geophysical Year (IGY) which in 1957–58 initiated New Zealand's first active involvement in scientific research in the Antarctic.

The past 25 years of international co-operation in scientific endeavour in the Antarctic brought the first real signs of a human presence to the continent. The research undertaken has resulted in a vast amount of knowledge being gained about this south polar region especially its place in the history of our planet.

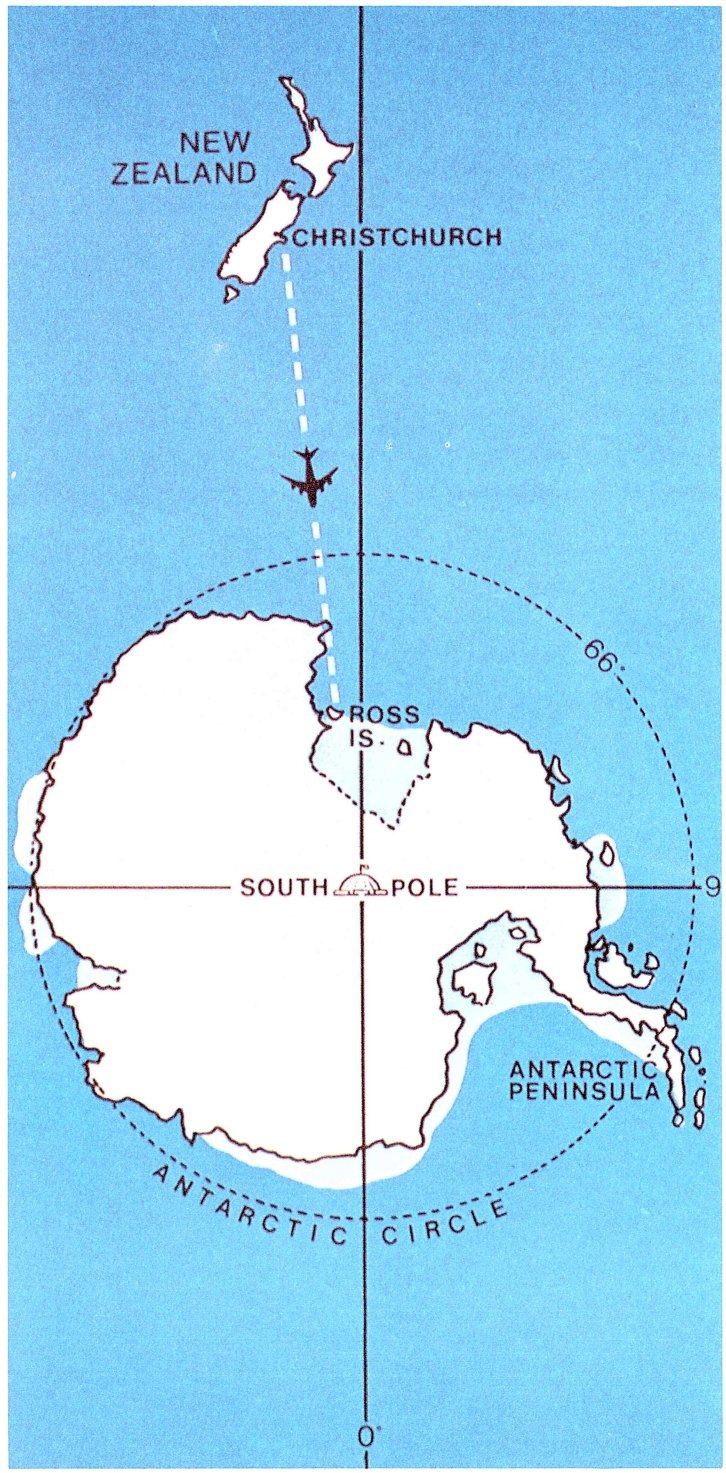
In recent years other activities have been suggested as likely to occur in the Antarctic in the foreseeable future and indeed some of these, such as tourism, are already taking place. Coupled with these recent developments has been an increasing international concern for the preservation of the world's natural environment.

While DSIR and other international agencies responsible for Antarctic programmes have given considerable attention to the preservation and protection of the Antarctic environment, little publicity has been given their efforts and the wide ranging measures they have introduced to minimize harmful interference.

This publication is intended to meet the need for factual information covering New Zealand's past policies and achievements in the Antarctic especially those concerned with environmental matters. Readers should therefore gain a better understanding of the important questions surrounding Antarctica today and the many positive steps already taken to preserve and protect its unique environment.

R. B. Thomson
Superintendent
Antarctic Division
Department of Scientific & Industrial Research
Christchurch

10 November 1982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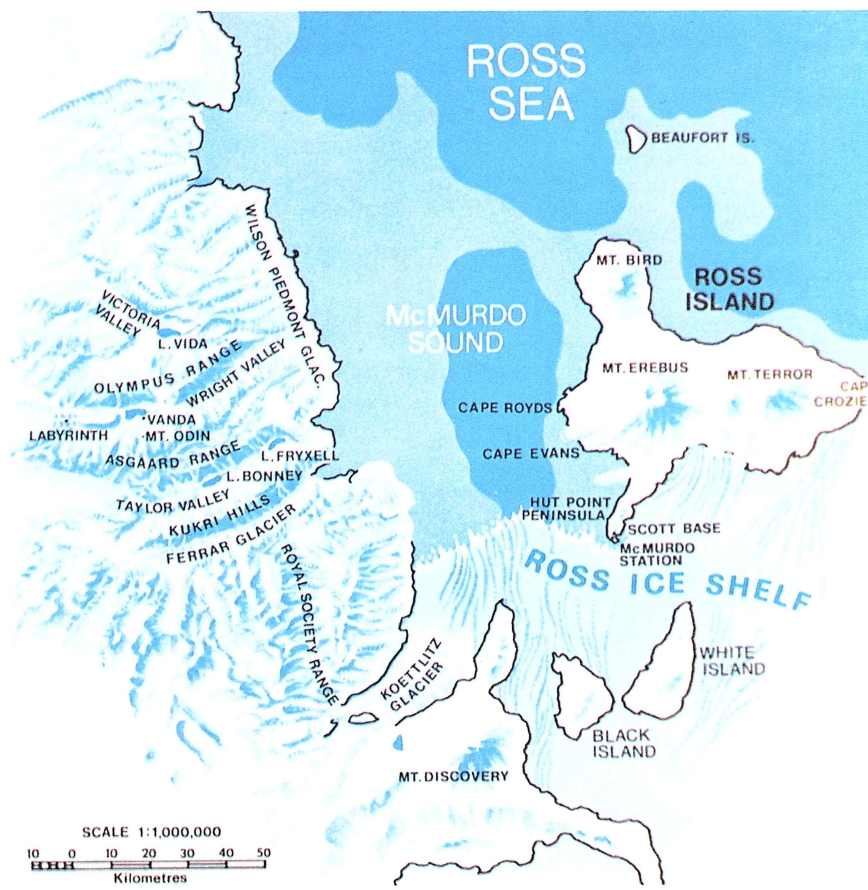
Introduction

Geographical proximity forged the first links between New Zealand and Antarctica. For almost a century, many Antarctic expeditions have used New Zealand as a staging point en route to the southern-most continent. An event of considerable significance occurred in 1923, when the British Government, by an Order in Council, placed that region of Antarctica, known as the Ross Dependency, under the jurisdiction of the Governor-General of New Zealand.

Since first establishing Scott Base in 1956, New Zealand has maintained a continuous presence under the direction of the Antarctic Division of the Department of Scientific and Industrial Research. New Zealand's early recognition of the likely impact of man on the Antarctic environment has enabled us to play a leading role amongst the international Antarctic community in formulating and implementing conservation measures. In order to fully appreciate the measures already operative and those under consideration, and why restraints are necessary, it is important to understand the geography of the continent, the nature of New Zealand's Antarctic programme and the significance of the Antarctic environment.



Map of Ross Island, McMurdo Sound, Dry Valleys region of Victoria Land.

Geography

The Antarctic continent covers nearly 14 million sq km, about the size of the combined areas of the United States and Australia. Approximately 98% of its surface is covered by a thick ice sheet up to a depth of some 4,000 metres in places. This volume of about 25 million cubic km represents over 90% of the world's ice and contains some 72% of its fresh water. The ice cap is the major contributor in making Antarctica the highest of all continents with a mean elevation of about 2,500 metres. In addition to its land area, Antarctica has over 2 million sq km of permanent ice shelves, while around the continent the sea ice varies in area from about 3 million sq km in late summer to a maximum of about 20 million sq km in later winter.

Despite its huge reservoir of frozen water, Antarctica is the world's largest desert. The mean annual precipitation over the whole continent amounts to a mere 10 cm with a water equivalent of only about 3 cm.

Near the coast the ice sheet thins out and its shape and movement is increasingly affected by the sub-glacial relief. Along about half of the coast the ice feeds into the ice shelves with thicknesses generally of between 200 and 1,300 metres. Even off-shore the continent is distinctive in form. The continental shelf has a mean width of only about 30 km and in some places does not exist at all. The shelf is most notable for its great depth at its outer edge 400/600 metre depths are common and in the Ross Sea the edge lies at some 800 metres.

There are few areas of the continent that are ice free. These are generally called the "oases", the largest of which is located in Victoria Land near the coast of the Ross Sea and known as the "dry valleys". Here post-glacial processes have begun. Soils have started to form, lichens, mosses and algae exist, rivers flow and lakes lose much of their ice cover during the short summer. The sediments of these lakes hold clues to the climatic history of the area for they contain the products of glacial erosion and retreat and encroachment of the sea. Off-shore too, in the Ross Sea, the glacial and marine deposits form a stratigraphic column of great importance in studying the history of the ice sheet.

View of former joint N.Z./U.S. Hallett Station with Mt Herschell in the Admiralty Mountains in the background.

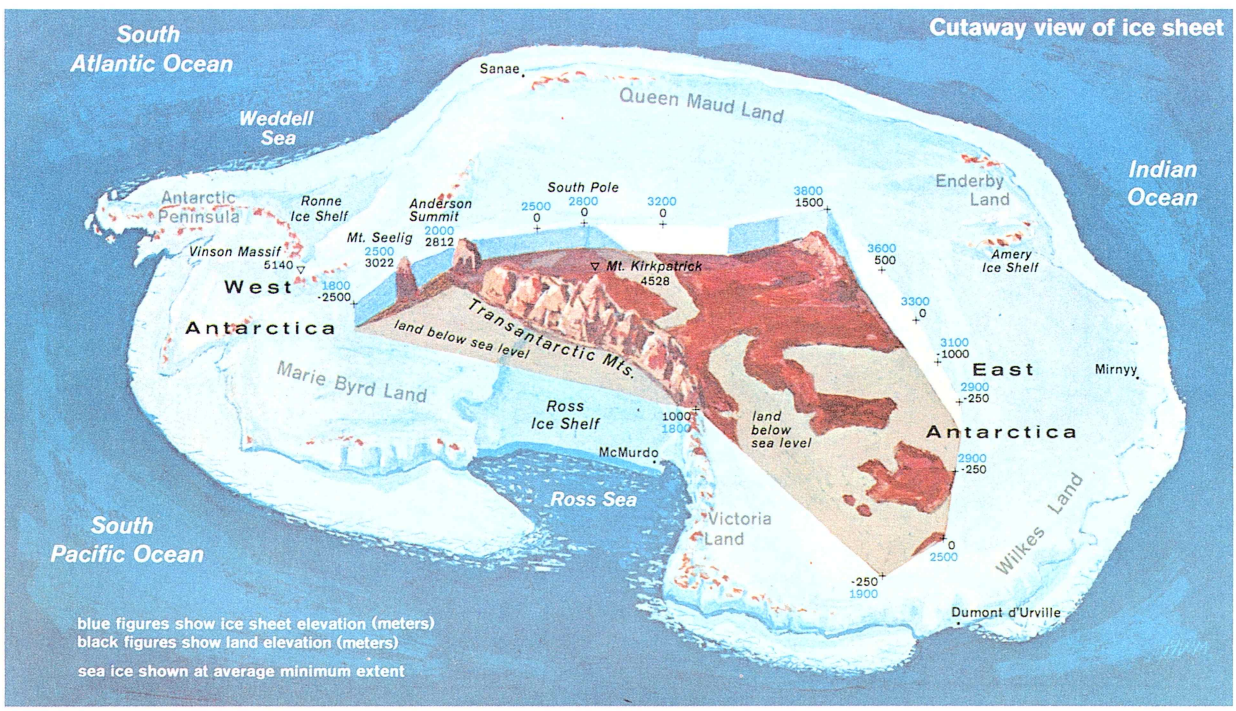
Administration of the New Zealand Antarctic Programme

The Ross Dependency Research Committee is responsible to the Minister of Science and Technology for formulating the New Zealand Antarctic research programme. Government appointed, the Committee comprises representatives of many Government Departments, Universities, non-government agencies and scientific disciplines with Antarctic interests.

Antarctic Division, DSIR, is in turn, responsible for implementing the approved research programmes and for ensuring sound management of New Zealand activities and environmental policy in Antarctica.

New Zealanders have been active in Antarctic exploration and scientific research since 1956. Today, up to 300 New Zealanders are involved in Antarctica during the summer season, conducting scientific studies at Scott Base and in other more remote areas of the Ross Dependency and providing the support facilities so vital to Antarctic operations. Many participate in international projects particularly with the United States Antarctic programme, with which we co-operate closely.

Cut away view of Antarctic ice sheet.



New Zealand Bases

Scott Base, located at Pram Point near Cape Armitage on Ross Island, was established in 1957 to house New Zealand's first Antarctic expedition. This was to support two major events, the Trans-Antarctic Expedition (TAE) and the research programmes we had committed ourselves to as an important part of the International Geophysical Year (IGY). Since then Scott Base has been continuously occupied by support staff and scientists and the New Zealand research programme has been progressively expanded. In order to adequately provide for the increasing numbers of personnel participating in research activities, a base rebuilding programme was commenced in 1976, which includes construction of a new laboratory, power house, and administration and accommodation facilities. This project, to be completed in the mid 1980s, should meet New Zealand's needs in the Antarctic for many years to come.

Scott Base, Pram Point, Ross Island.

Up to 12 staff members stay over the winter at Scott Base to sustain important continuous scientific observations. The base is one in a chain of international observatory stations used for the study of upper atmosphere and earth sciences. Arrival Heights 3 km north of Scott Base is designated a Site of Special Scientific Interest (SSSI) in order to provide an electrically quiet area where we are able to monitor and record a variety of changes occurring in the lower ionosphere.

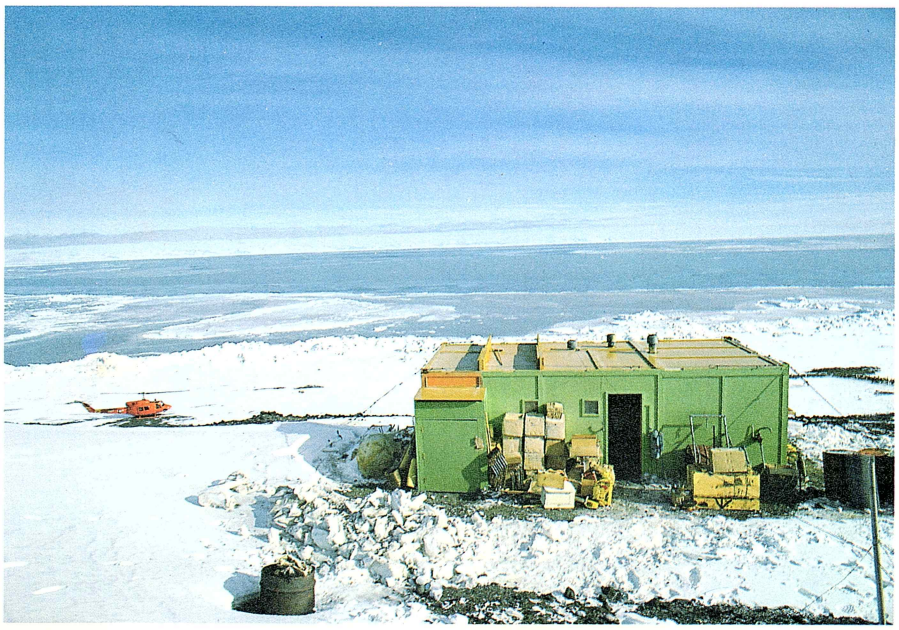
Vanda Station, situated near the shores of Lake Vanda in the dry valleys region, operates during the summer season. Vanda functions as a support base for field parties conducting research activities in the dry valleys and as a centre of meteorological, hydrological and glaciological studies designed to better understand the unique climate of the region.

Cape Bird, situated 60 kilometres north of Scott Base on the northern

tip of Ross Island, serves as a summer base for biological field parties conducting projects in terrestrial and marine biology.

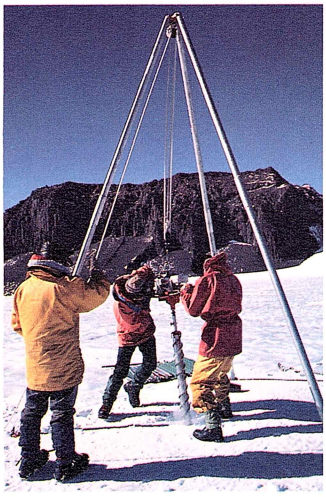
Other summer huts, fully provisioned in case of emergencies, are also maintained at Lake Fryxell, Asgard Range, Lower Wright Valley, Miers Valley, Cape Evans and Cape Royds.

Vanda Station, located on the shores of Lake Vanda, Wright Valley, Victoria Land.



Biology Hut at Cape Bird.

Scientific Achievements



Drilling operations to obtain temperature profiles on the Heimdahl Glacier, Victoria Land.

New Zealand scientists have contributed substantially to the fund of knowledge being amassed on Antarctica by the international scientific community. Some of our more notable achievements include:

The topographical and geological mapping of most of the New Zealand claimed Ross Dependency (an area of 770,000 sq km).

Detailed geological investigations in selected areas of the Dependency providing information on the geological history of Antarctica. Significant discoveries and conclusions include:

The discovery of a fossil bone fragment from a triassic amphibian – the first record of tetrapod life in Antarctica and similar to discoveries made in South America and South Africa.

Numerous discoveries of fossilized plants, petrified trees and coal, all indicative of warmer climates in ages past.

Correlations in age and composition of many Antarctic rocks to those found in other southern latitude continents.

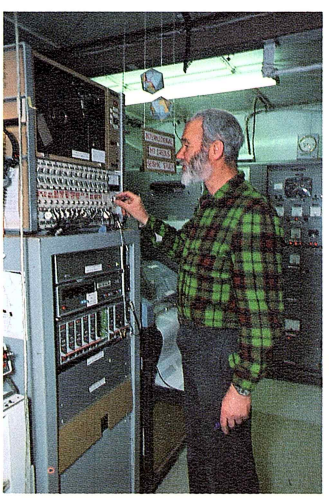
(Note) From this range of evidence it is now generally agreed that Antarctica was indeed the southern anchor point of the super continent of Gondwanaland, which also included South America, India, Africa, Australia and New Zealand in its great land mass. This conclusion is important to a better understanding of the geological history of this planet, and to the processes at work contributing to continental drift. Also, this has importance in assessing the possibility of the Antarctic continent containing mineral deposits

Drilling rig for the dry valleys drilling project.

Since the International Geophysical Year of 1957–59 (IGY), Antarctica has been more than a laboratory for the study of the evolution of the Continents. During IGY it was used most effectively as a platform to observe and record those phenomena likely to be associated with the solar/terrestrial relationship. Previously the range and magnitude of this relationship was little understood and grossly under-estimated. Such observations and data gathering could only be done at high latitudes and at permanent stations, where continuous data could be recorded over a period of several years. This could not be accomplished in the North Polar region because of the absence of land at the desirable high latitudes on which to build the necessary permanent stations.

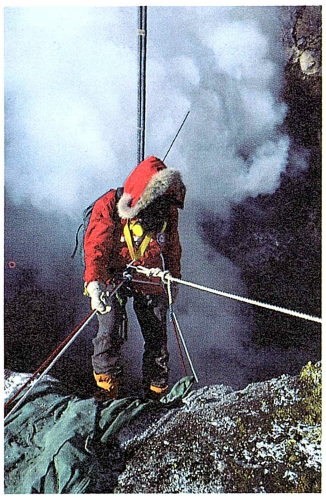
Marine fossils found in the Transantarctic Mountains.

Some forty observing stations which have operated continuously in the Antarctic over the past 25 years have provided a wealth of new information covering solar/terrestrial relationships. As one of the key stations in this network, the observatory at Scott Base has continuously gathered data over a period of more than two sunspot cycles (>22 years). Important discoveries include the identifying of a solar wind which transports the strong solar magnetic fields to the earth, where they inter-connect with the geomagnetic field in the region known as the magnetosphere. Variations to this input have been found to affect the earth's ionosphere and its magnetic field, and more recent studies have been directed towards possible correlation between these solar changes and the earth's weather.



Mt Erebus seismic recording equipment, Scott Base.

New Zealand biologists have gained considerable knowledge about the primitive forms of life that survive in the narrow life support zones of the Antarctic. Birds, seals and fish have been found to have unique body mechanisms for withstanding the abnormal environment and our studies have provided data of considerable value to the wider field of human biology and medicine. In recent years biologists have concentrated more on environmental problems and the study of the ecosystem of the Southern Ocean, especially the population dynamics of various species



N.Z. volcanologist attempting descent into the crater of Mt Erebus.

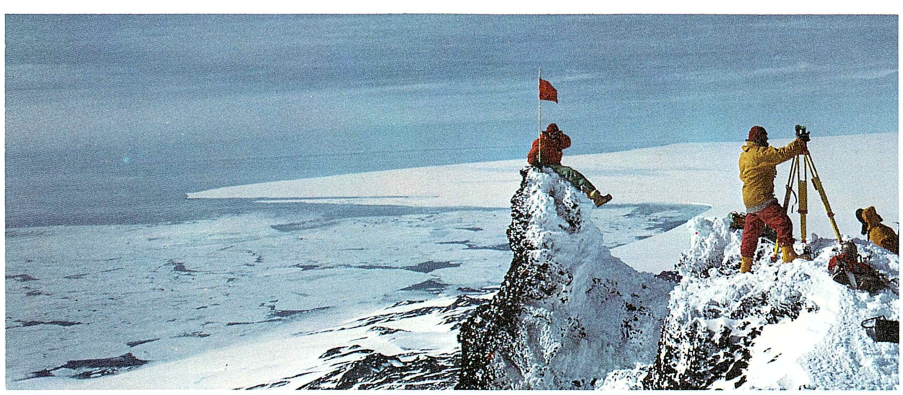
including Krill – potentially the largest resource for feeding the world's expanding millions.

One of the greatest attractions for research in Antarctica has been its ice budget and the morphology of the ice sheet. New Zealand glaciologists and meteorologists have combined their efforts in recent years in studying the recent climatic history and current trends. These efforts have been most productive in the unique dry valley areas of Victoria Land, based at Vanda Station, which was established for this purpose in 1968. New Zealand geologists have also contributed to the study of past climate, where much of the research has been undertaken through New Zealand's major involvement in the first deep drilling programmes in Antarctica recently conducted in McMurdo Sound and the dry valley area.

We now have evidence of major climatic changes in the past and that the Antarctic ice sheet which is inherently unstable, has surged periodically into the Southern Ocean to form a huge ice shelf, thus raising the level of the world's oceans sufficient to inundate all low lying land areas of the world. Total melting of the ice cap would be an even greater disaster for this would result in a sea level rise of 55 metres.

The New Zealand Antarctic Research Programme has continued to increase over the years both in scope and magnitude. There has also been a significant evolution in research objectives and methods. The most fundamental change has been the shift from field reconnaissance studies, which are largely complete, to investigations of more intricate natural phenomena and of large scale processes at work in the atmosphere, the ice, and the Southern Ocean, all of which have major global implications. Routine environmental observations and small independent projects are still being done but the emphasis is on long term interdisciplinary and international efforts where N.Z. scientists combine their talents with those of many other countries.

The end product of the New Zealand scientific effort in Antarctica can best be measured in data produced and published material. In twenty-five years the New Zealand Antarctic Programme has provided several hundred thousand "words" to World Data Centres and New Zealanders have had 1,484 papers published in recognised scientific journals worldwide. This achievement places New Zealand as number three producer of scientific information among all those countries conducting research in the Antarctic.



Surveyors at work in the Royal Society Mountains Range of Victoria Land.

New Zealand and Antarctic Environmental Protection

Despite a quarter century of intense and rewarding research covering many fields of science, much remains to be learnt about the Antarctic. However, from research to date, it is evident that the Antarctic environment is relatively fragile and one which requires careful regulation particularly of human activity.

Controls have been introduced in a number of ways.

Progressively, Antarctic Division has introduced important rules which relate specifically to New Zealand activities. Pre-season training of staff provides an awareness to all aspects of environmental protection. Within Antarctica, both Scott Base and Vanda Station are operated in accordance with the Division's minimum impact code. For example, rubbish from Scott Base is either returned to New Zealand for recycling, or if disposable, burnt in a specially designed incinerator. Vanda Station in the dry valleys of Victoria Land, has particularly stringent operating procedures. Power for the station is provided by a wind generator and solar panels. Vehicles are not permitted to operate beyond 500 metres from the station and all waste is removed by helicopter to Scott Base. These measure ensure that the impact of any scientific research conducted at Vanda is kept to an absolute minimum, thus protecting the unique nature of the dry valleys.

Additional controls have been worked out in conjunction with the United States Antarctic research programme. These relate to activities which may have an impact on the environment within the McMurdo Sound area. Co-ordination and management is the responsibility of the McMurdo Land Management and Conservation Board which was established in 1967 with representation from Antarctic Division, the U.S. National Science Foundation and U.S. Navy. The Board exemplifies the

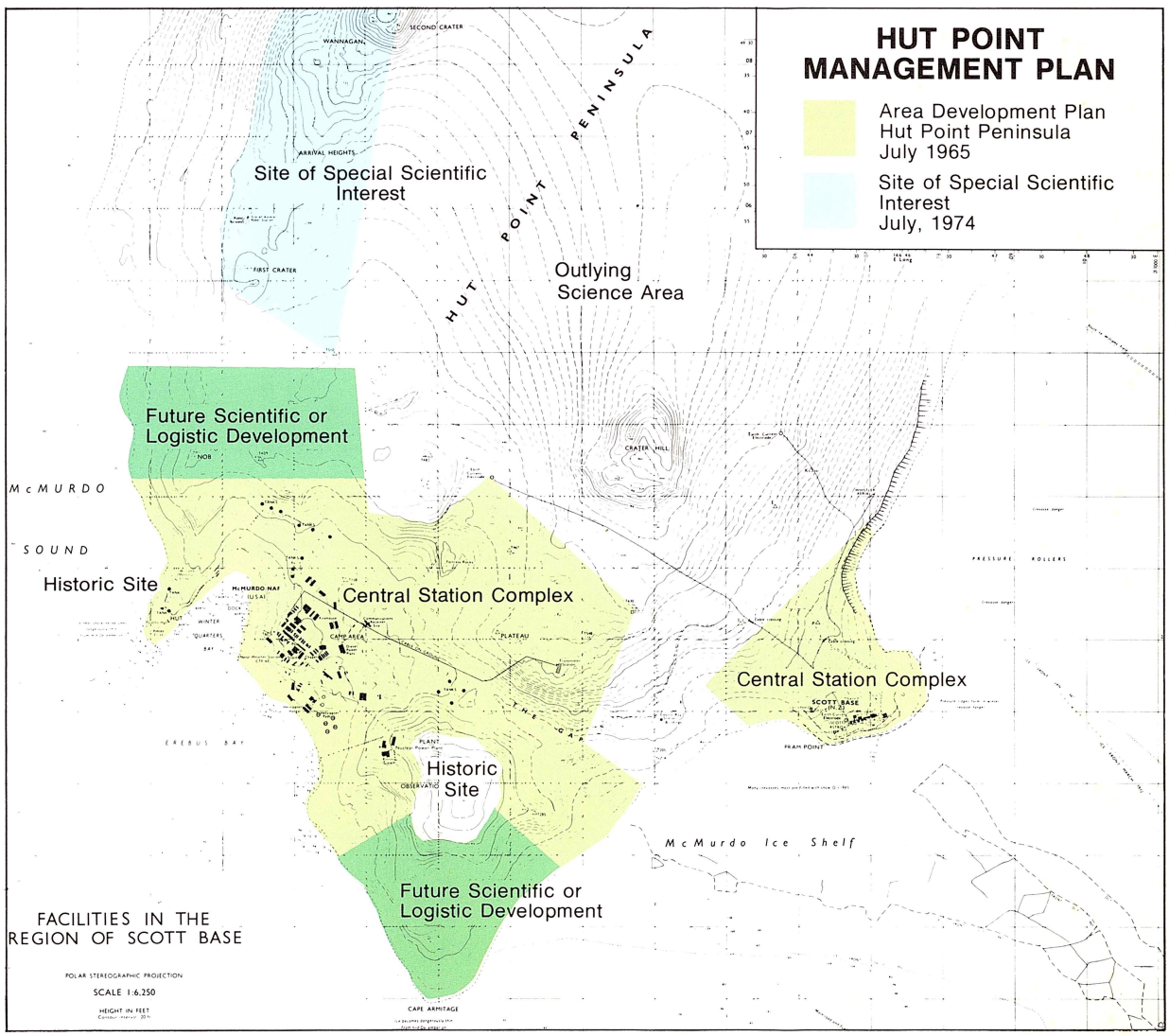
Don Juan Pond, dry valleys, Victoria Land.

close co-operation which exists between the United States and New Zealand in the operation of scientific programmes and matters of mutual concern relating to the Antarctic environment.

Land use classifications have been implemented by the Board covering the areas immediately surrounding McMurdo Station and Scott Base and include the zoning of central station complexes, future scientific or logistic development areas, historic sites and an outlying scientific installation. During the late 1960s, the Board instigated a general clean-up of the Hut Point Peninsula and a similar joint programme in the dry valley region. Many old food dumps and unused items of equipment were removed. Subsequently, all activities in these areas have been strictly controlled and dumping of waste or altering of the landscape is prohibited.

There are international environmental controls adopted from recommendations made under the Antarctic Treaty. Generally these had their origins, either in the practices of national research programmes, such as those introduced by New Zealand or from proposals put forward by the international Scientific Committee on Antarctic Research (SCAR).

Land use management plan McMurdo Station and Scott Base areas of Hut Point Peninsula, Ross Island.



The Scientific Committee on Antarctic Research (SCAR)

SCAR was constituted in 1958 by the International Council for Scientific Unions (ICSU), to initiate, promote and co-ordinate scientific activity in the Antarctic. Fifteen countries comprise committee membership which is open to any country actively engaged in Antarctic Research. New Zealand scientists have played an important role in SCAR, many holding positions of responsibility within the organisation.

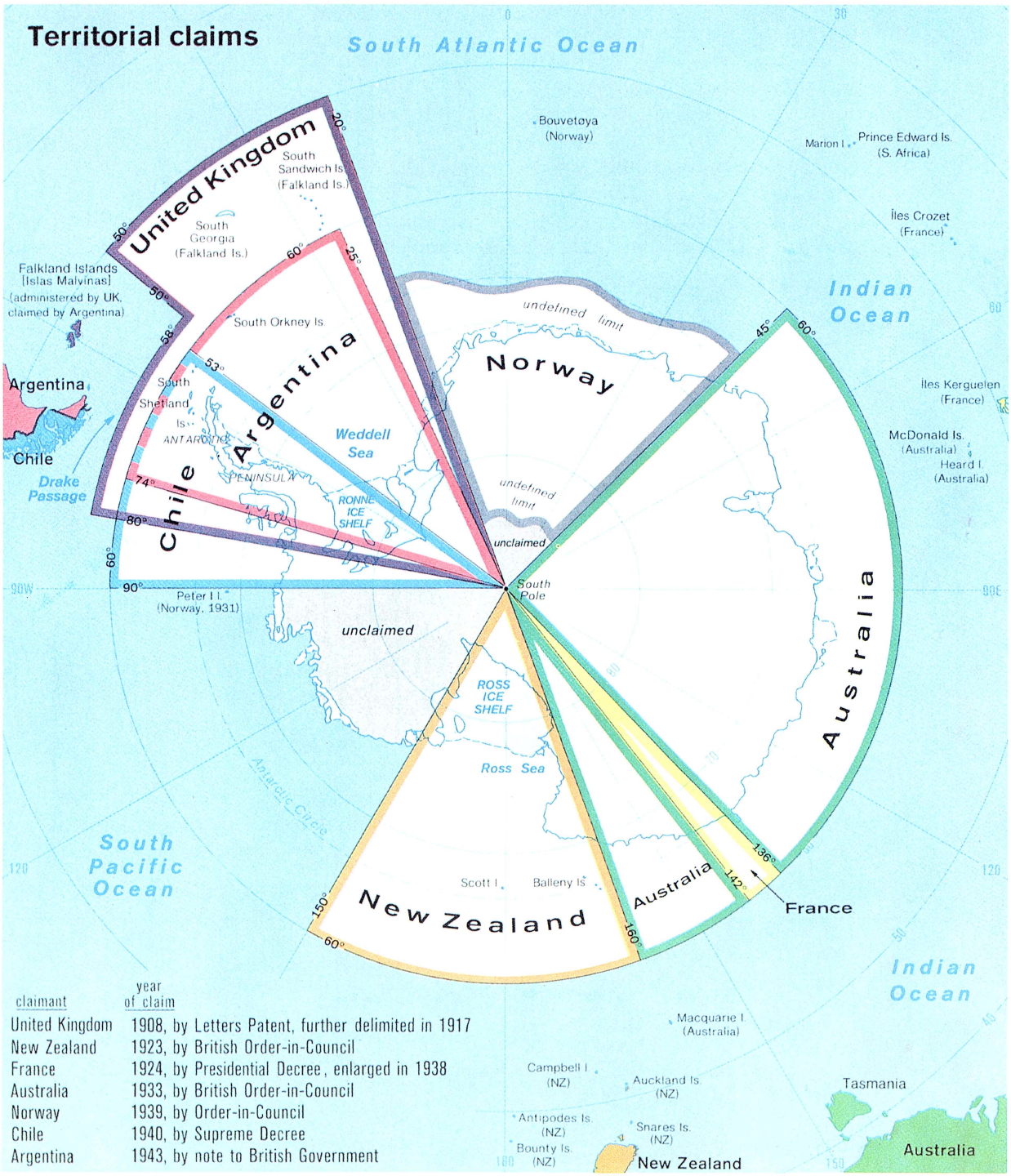
SCAR acts as a primary source of scientific advice to the Antarctic Treaty governments. Through SCAR initiative a set of environmental ground rules was introduced in 1964, to regulate activities in Antarctica. Known as "The Agreed Measures for the Conservation of Flora and Fauna" they were formally adopted by Treaty members in the same year. Additional recommendations subsequently made include measures to control the use of radio isotopes, waste disposal and controls on the introduction of alien species.

Since the early 1970s, SCAR has given considerable attention to the possible environmental consequences of those activities likely to be conducted should exploitation of living or mineral resources take place. A special working group on the living resources of the Southern Ocean provided baseline scientific information for the Treaty Nations in drawing up the Convention for the Conservation of Antarctic Marine Living Resources. More recently SCAR has launched the BIOMASS programme (Biological Investigation Of Marine Antarctic Systems and Stocks); a ten-year co-ordinated international research programme investigating every aspect of the Antarctic marine ecosystem.

SCAR has also provided the Treaty nations with detailed information on questions of mineral resources. In this regard two major studies have been co-ordinated involving SCAR working groups. A first report on the assessment of the environmental impact of mineral exploration and exploitation was published in 1979 and a working group is currently examining more detailed aspects of the environmental implications of the minerals issue.

Thus SCAR has proved an effective medium through which the concerns and advice of the Antarctic scientific community are communicated to the political/legal decision-makers of the Antarctic Treaty.

View of Taylor Valley, dry valleys region of Victoria Land.



claimant	year of claim	
United Kingdom	1908,	by Letters Patent, further delimited in 1917
New Zealand	1923,	by British Order-in-Council
France	1924,	by Presidential Decree, enlarged in 1938
Australia	1933,	by British Order-in-Council
Norway	1939,	by Order-in-Council
Chile	1940,	by Supreme Decree
Argentina	1943,	by note to British Government

The Antarctic Treaty

Flags of the Antarctic Treaty nations flying at the South Pole.

The success of the International Geophysical Year (1957–58) clearly demonstrated how international co-operation in science could be achieved.

The IGY brought a new spirit of co-operation to Antarctic affairs. It brought a breathing space in the form of an understanding that scientific activity conducted during the IGY would not prejudice the positions of the various countries regarding territorial claims and paved the way for a period of stewardship in Antarctic affairs.

In late 1957 and early 1958 many consultations took place between various agencies of interested governments where it was generally agreed that some more permanent special regime would be desirable to continue to foster co-operation in scientific research and in order to resolve so far as possible, the differences of opinion on the question of territorial sovereignty.

Accordingly, on May 2, 1958 the United States took the initiative in proposing that a conference be convened to conclude an Antarctic Treaty.

Following further negotiations during a series of preparatory talks held from June 1958 and continued for well over a year, the Conference on Antarctica convened on October 15, 1959 and closed on December 1, 1959 with the signing of the Antarctic Treaty on that day by the twelve nations represented.

The Treaty which entered into force on June 23, 1961 is a remarkable and probably unique international instrument. It formalized and guaranteed the kind of free access and research rights that had spelt success for the International Geophysical Year and established a legal framework for all countries both claimant and non-claimant, to work together for the common cause. That it managed to balance these complex and competing interests in a simple yet practical accommodation is perhaps the most remarkable thing about the Treaty. It also requires that Antarctica should be used for peaceful purposes only, thus prohibiting activities of a military nature in what could be described as a disarmament regime which is still the most comprehensive in the world and the only one which specifically provides for on-site inspection. The Treaty also prohibits nuclear explosions and the dumping of nuclear waste, but requires that each Contracting Party shall annually provide advance notice to the other Contracting Parties, of expeditions planned, stations occupied, and military personnel or equipment involved in the support role.

The 60th South parallel, which runs through open water, was selected as the Antarctic Treaty border-line, creating an unique international accommodation in a combination of geographical and political circumstances found nowhere else.

A major feature of the Treaty is the Consultative system which it establishes. The record is impressive. During the years since 1961 when the Treaty came into force, eleven Consultative Meetings have been held.

A large number of Recommendations have been adopted and have covered such areas as:

the exchange of information
interchange of scientific personnel
the preservation of historic sites
the conservation of fauna and flora
man's impact on the Antarctic environment
the adoption of specially protected areas and sites of special scientific interest
guidelines for tourist and private expeditions
logistics
marine and mineral resources
pelagic sealing

In all, a total of 130 Recommendations have been adopted from the eleven Consultative Meetings, of which 67 have been concerned with environmental matters.

There is a popular misconception that the Treaty system will have to be replaced anyway because the Treaty comes to an end in 1991. This is not the case. The relevant passage from the Treaty, Article XIII 2 (a) states:

"If after the expiration of thirty years from the date of entry into force of the present Treaty, any of the Contracting Parties so requests, a Conference of all the Contracting Parties shall be held as soon as practicable to review the operation of the Treaty."

This in no way implies an ending to the Treaty at that time even should any of the Contracting Parties seek such a review.

New Zealand has consistently supported all conservation oriented recommendations made under the Antarctic Treaty and indeed, in many cases, has taken the initiative in the introduction of such measures at Treaty meetings. Much of the New Zealand initiative has resulted from experience over a number of earlier years, within the New Zealand Antarctic Research Programme.

Important Recommendations agreed to at Antarctic Treaty Consultative Meetings and subsequently approved by member governments include:

(i) PROTECTION OF FLORA AND FAUNA

Overall protection for native animals and birds is provided for under the New Zealand Antarctic Amendment Act 1970 and the Antarctic (Fauna and Flora) Regulations 1971 which give statutory effect to the Antarctic Treaty Agreed Measures for the Conservation of Fauna and Flora.

Genuine restraint is employed in the issue of permits and it is a Treaty requirement that nations exchange information on details of all permits issued. Antarctic Division applies rigid restriction, not only to mammals and birds, but to the collection of all samples, including rock and plant specimens.

Adelie Penguins at Cape Hallett.

(ii) SEALS

New Zealand is a party to the 1972 Convention for the Conservation of Antarctic Seals. Commercial sealing does not take place in Antarctica but since 1978 the Convention has provided the means for regulations should such activity eventuate. Catch limits are set for the Crabeater, Leopard and Weddell seals while the Ross, Southern Elephant and Southern Fur are totally protected.

Weddell Seal.

(iii) SPECIALLY PROTECTED AREAS

Certain areas of outstanding scientific interest within Antarctica are set aside as Specially Protected Areas (S.P.A.s) in order to preserve their unique natural ecological system. Entry to these areas and the collection of fauna and flora is prohibited, except in cases for "compelling scientific purposes" when a permit may be issued. No such permits have been issued to date.

Within the Ross Dependency, there are S.P.A.s at Cape Hallett, Cape Crozier, Sabrina Island and Beaufort Island.

Emperor Penguins.

(iv) SITES OF SPECIAL SCIENTIFIC INTEREST

New Zealand introduced, through SCAR in 1972, the concept of scientific reserves, or Sites of Special Scientific Interest (SSSIs). These are

Antarctic tourist ship "Lindblad Explorer" makes annual voyages to the Antarctic continent during summer months.

designated areas to be used exclusively for specific research programmes and not necessarily restricted to protection of fauna and flora as with S.P.A.s. There are four SSSIs in the Ross Dependency. Two cover the penguin colonies at Cape Royds and Cape Crozier; one at Arrival Heights near Scott Base which is designated a "quiet area" for upper atmospheric research and the Barwick Valley representative of an undisturbed area in the Dry Valleys region. For each site there is a specific management plan which details the scientific research which may be conducted and imposes limitations on access and the taking of samples.

(v) HISTORIC SITES

New Zealand has assumed responsibility for the care of historic sites associated with early Antarctic expeditions in the Ross Sea region. Together with the N.Z. Antarctic Society, Antarctic Division has restored huts of Sir Ernest Shackelton's 1907–08 expedition at Cape Royds and Captain Robert Falcon Scott's 1910–1912 expedition at Cape Evans. Scott's 1901–03 hut at Hut Point was also restored in co-operation with the United States authorities. Other historic sites are located at Cape Crozier, Inexpressible Island and Cape Adare. All huts situated on Ross Island are checked annually to determine their condition. Periodic maintenance is undertaken by Antarctic Division, staff of the National Museum, and members of the N.Z. Antarctic Society. Entry to the huts is controlled by the Officer in Charge at Scott Base.

(vi) TOURISM

New Zealand was the first country to recognize the need to minimise any adverse effects arising from tourist activity. Similar policies, based on the New Zealand initiative have been introduced by other countries, and in fact are now embodied in Treaty Recommendations. Treaty nations are required to notify member governments of tourist and other non-scientific expeditions which must be organised in a manner not prejudicial to the conduct of scientific research, the conservation of fauna and flora or the operation of Antarctic bases. Tourist ships entering the Ross Sea area usually have on board, a nominee of Antarctic Division to act as a ranger/guide to control and monitor tourist activity.

Shackleton's Hut, Cape Royds.

Recent Developments

(i) MARINE LIVING RESOURCES

Questions relating to possible exploitation of Antarctic marine living resources and the need for some adequate measures of control have been discussed at both SCAR and Treaty Meetings since the mid-1960s. Further developments in commercial fishing interests in the waters surrounding Antarctica, give urgency to the need for concluding some appropriate agreement for the protection of all living resources and for the establishment of sound conservation practices to prevent overfishing and to protect the integrity of the Antartic marine ecosystems. By 1980, Treaty members had reached agreement on the necessary measures and the Convention on Conservation of Antarctic Marine Living Resources was signed in Canberra. The New Zealand Government ratified the Convention in April 1982.

Under the terms of the Convention, a Commission has been established at Hobart, Tasmania, with the responsibility to "formulate, adopt and revise conservation measures on the basis of the best scientific evidence available". Regulation of fishing activity, including the setting of catch limits is a major task of the Commission, which meets annually so that conservation measures may be continually reviewed and developed in response to changing needs.

The Commission is charged also with ensuring that protection and harvesting are based on sound scientific principles. To this end a scientific committee has been created to provide for "consultation and cooperation concerning the collection, study and exchange of information". The Convention stipulates that not only must resource populations be maintained at a sustainable level, but also that the ecological relationship between the harvested, dependent and related species be preserved.

Killer whale near Cape Bird.

A close working relationship between such organisations as SCAR and the Commission is provided for in the Convention as are provisions for participation by States which are not parties to the Antarctic Treaty.

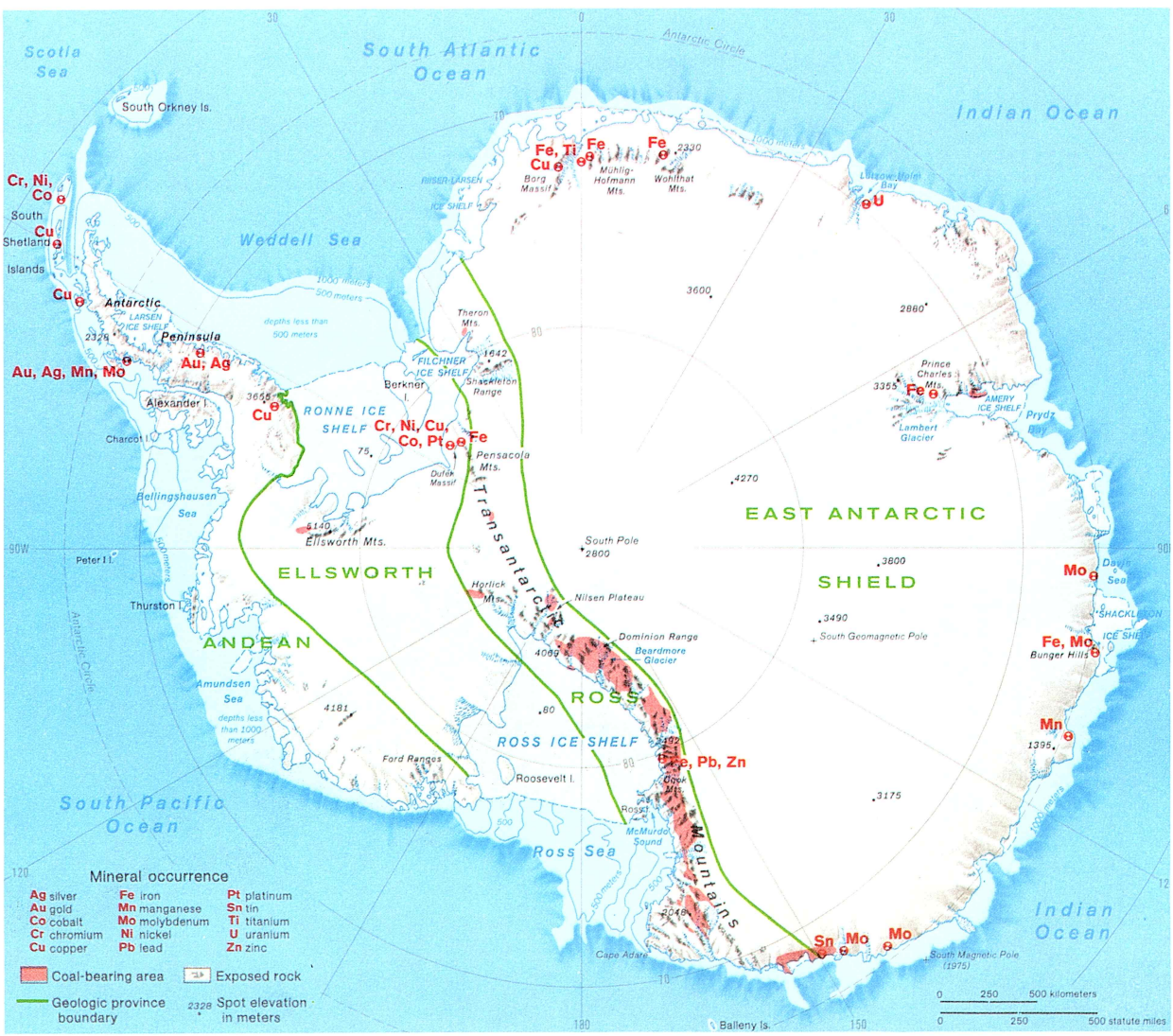
By insisting that the population levels of exploited species and the balance of the ecosystem is preserved, the Convention has established a sound framework within which the conservation and rational exploitation of Antarctic waters may take place.

(ii) MINERAL RESOURCES

Despite the fact that no mineral deposits offering potential for commercial exploitation have yet been found in the Antarctic, the possibility that some "discovery" may be made at some time has raised a most controversial and important issue.

In the late 1960s the geology of Antarctica became better known and some geologists were bold enough to make predictions about the likely mineral wealth of Antarctica based on a few "occurrences" only and anal-

Map showing known mineral occurrences in Antarctica.



ogies they made with the surrounding continents from their reconstruction of Gondwanaland. Much of the geology of Antarctica however has remained poorly known due to its covering by a thick cap. The minerals located in the few areas of exposed rock have not proven of any commercial value especially when related to the high costs of operating in the extreme polar environment and remoteness from world markets. To be economically attractive, minerals in the Antarctic continent would need to be large deposits of high concentration and value with best possible access to transportation.

The failure to find a "pot of gold" on land has not lessened the interest and speculation in the likelihood of some off-shore areas of Antarctica containing hydrocarbons in large enough quantities to make exploitation attractive. Thus far there is no conclusive evidence for or against such a possibility and indeed a great amount of concentrated exploratory work would be required to provide some conclusion.

The energy crisis of the mid 1970s brought more attention to the Antarctic as offering a vast source of oil and gas but the passing years saw almost a complete reversal to the energy scene and a relaxing of effort to discover new fields especially those in remote and operationally hazardous areas such as Antarctica.

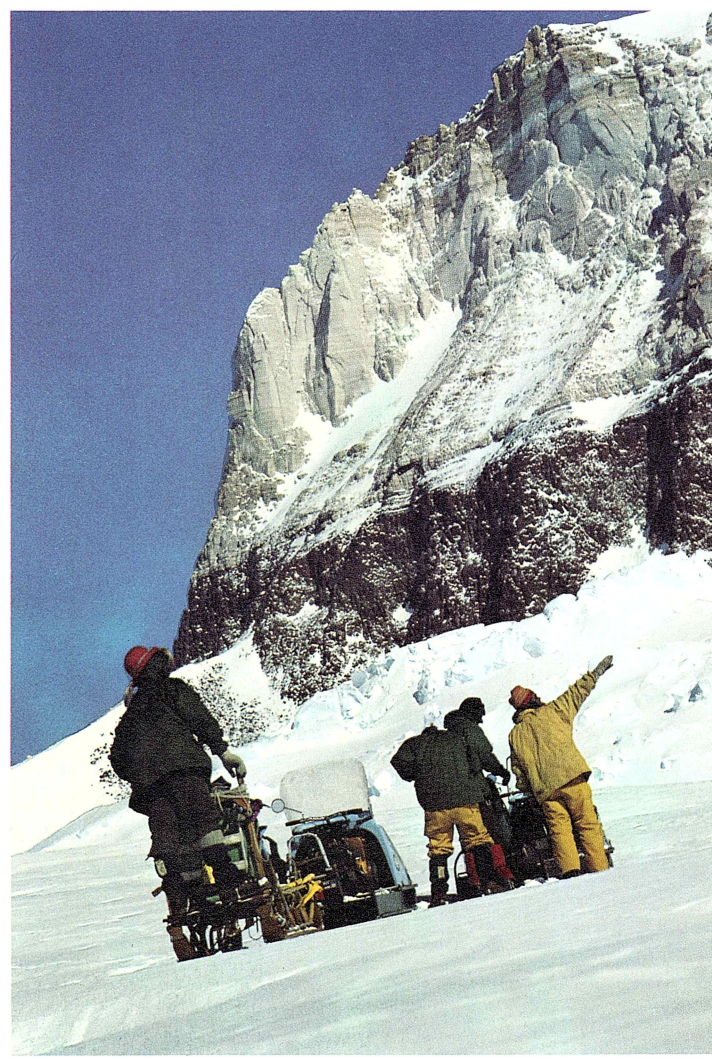
International interest in Antarctic minerals was aroused soon after Antarctic Division raised this matter with the N.Z. Ministry of Foreign Affairs in 1969. The New Zealand delegation to the Antarctic Treaty meeting in Tokyo 1970 sought reaction from other delegations informally and the question of mineral exploration was formally introduced at the next Treaty meeting in Wellington 1972 and subsequently referred to in Recommendation VII – 6 "Antarctic Resources – Effects of Mineral Exploration". It is interesting to note that at this very initial stage the Treaty partners recognised "That mineral exploration is likely to raise problems of an environmental nature and that the Consultative Parties should assume responsibility for the protection of the environment and the wise use of resources". Many special meetings under the aegis of

Deposits of low grade coal have been found in the dry valleys region but offer no commercial potential.

SCAR and the Treaty followed, to identify environmental problems and consider the best methods of dealing with them. Treaty meetings were also involved in considering the many legal/political problems associated with mineral exploitation in the Antarctic.

In 1977 the Treaty nations agreed to refrain from conducting any exploration or exploitation, pending the negotiation of agreed solutions to the Antarctic mineral resources issue. Fundamental to these negotiations and embodied in the recommendation of the XI Antarctic Treaty meeting is the principle that protection of the "unique Antarctic environment and its dependent ecosystems" should be a basic consideration in the conclusion of any regime. Recent negotiations revealed a consensus view that exploitation will not be permitted unless satisfactory measures to protect the environment are first put in place.

In view of all the more recent events on the likelihood of the existence of exploitable minerals in Antarctica it would appear that commercial activity related to exploration for or exploitation of minerals in the Antarctic is just as far away today as it was when we first raised the question over 13 years ago.



Salient Glacier on the east side of the Royal Society Range, Victoria Land.

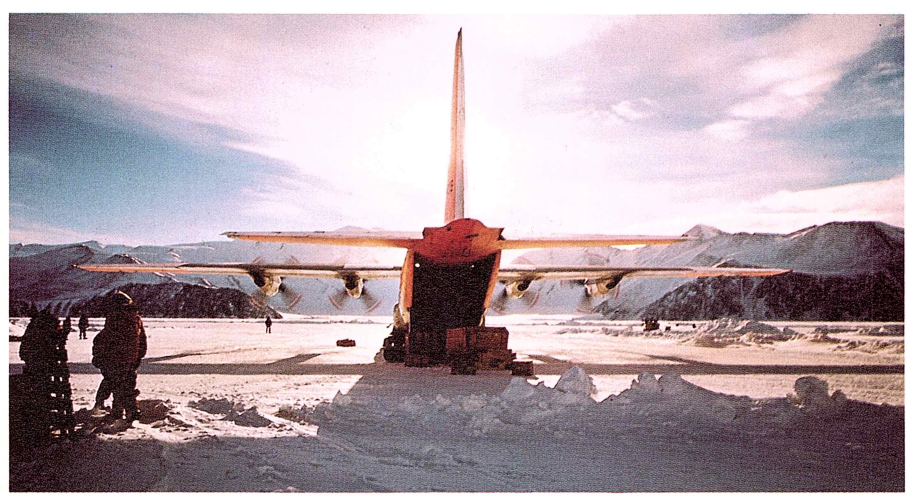
The Future

The future of Antarctica is bound to be closely linked to those changes that take place in the rest of the world. To forecast what these changes may be in a troubled and turbulent world is a formidable task.

There is little doubt however that science will continue as the main activity in the Antarctic for many years to come. There are many questions of fundamental importance yet to be resolved. These include the major problem of climatic-glacial history and its global interaction. Geologists require a better understanding of the relationship between East and West Antarctica, which may be gained through more intensive studies of the Trans-Antarctic Mountains. The obtaining of ocean floor sediment samples along the Victoria Land coast as part of a drilling programme planned to be undertaken by New Zealand during the mid 1980s should greatly aid in resolving this problem. Further detailed studies between the various tectonic provinces of Antarctica and those of the surrounding continents will enable a more accurate re-assembly of the ancient super continent of Gondwanaland. Such work should also allow a clearer identification of any areas of Antarctica likely to contain mineral deposits.

Research programmes in the biological sciences will likely follow two paths. One will be to continue to give attention to matters of environmental concern with emphasis on minimising harmful interference. The other is closely related for it involves continuing studies of the Antarctic ecosystem especially the relationships of the various species and the effect that any reduction in numbers of one species may have on the ecosystem as a whole. As most are confined to the ocean it follows that most research will be in marine biology and hence, require ship support, a capability which at present New Zealand does not possess.

When completed in the mid 1980s, the new Scott Base should be adequate to meet our needs for supporting a wide ranging and effective scientific programme in the Ross Dependency for many years to come. The new laboratory will facilitate continuing studies in upper atmosphere



Ski Equipped Hercules unloading after open field landing.

and earth sciences which are mainly concerned with solar/terrrestrial relationships. In the next several years, upper atmosphere research will focus attention on global climate studies as more serious attempts are made at identifying extra-terrestrial causes for many of the affects observed on earth. Additional new facilities designed to meet the increasing needs of other scientific disciplines (e.g. biology) will be included in this new Scott Base complex.

Whatever the future of Antarctica may be it seems certain that increasing attention will be given to some commercial activities. Tourism will no doubt continue to expand slowly and cautiously. However, any new activity will require very careful consideration given its operational feasibility with due regard to safety. The development of new technology will not necessarily mean a diminution of hazards likely to be encountered. Respect for the harshness and hostility of the Antarctic environment will always remain a prerequiste to completing a successful operation. History records only too well the many tragedies and near disasters which have befallen many new ventures in the past. Tourism is one recent example where major tragedies have occurred.

In the Antarctic it may well be that the hostility of its environment to human endeavour will safeguard it from harmful interference that could otherwise come from commercial activities. At least, the extreme difficulties of conducting operations in the Antarctic may slow down the implementation of any new ventures and it would be most unlikely (and unwise) for any sudden or dramatic new activity to take place in the foreseeable future. This almost static situation will continue to provide Antarctic scientists and administrators of today (who can claim to be best experienced in these matters) with time and opportunity to give appropriate attention to all new ventures at each stage of their development. In this way new policies, rules and regulations will be introduced to ensure that all human activity in the Antarctic continues to be undertaken with full attention given to the safety of operations and the protection and preservation of the Antarctic environment.

RNZAF Hercules.

Sunset in pressure ridges near Scott Base.